CLAIMS

1. An in vivo imaging device comprising:

at least one light source;

at least one imager; and

at least one controller, wherein the controller is configured to, during an imaging period, operate the light source, record the amount of light reflected to the imaging device, and control the image gain level of the imager.

2. The device of claim 1 comprising at least one light measuring element.
3. The device according to claim 2 wherein said at least one light measuring element includes at least a portion of a set of pixels.
4. The device according to claim 2 wherein the at least one light measuring element includes at least one photo detector.
5. The device according to claim 2 wherein said at least one light measuring element is integrated into said imager.
6. The imaging device of claim 1, wherein said controller is adapted to control at least one parameter selected from the group consisting of image gain level, illumination duration and illumination intensity.
7. The imaging device of claim 1, wherein said controller is adapted to control at least one parameter selected from the group consisting of illumination duration and illumination intensity for at least each one a plurality of light sources.
8. The imaging device of claim 7, wherein individual control of said parameter(s) is enabled by at least one control pixel for at least each one a plurality of light sources.
9. The imaging device of claim 8, wherein control pixel(s) is adapted to enable a fast read-out procedure.
10. The imaging device of claim 1 wherein when the amount of light recorded at a sampling point is below a determined saturation threshold, said controller is adapted to implement at least one of

the functions selected from the group consisting of increasing image gain level, decreasing illumination duration, and increasing illumination intensity.

11. The device of claim 1, comprising a transmitter.

12. The device of claim 1, comprising at least one measurement tool.

13. The device of claim 12, wherein said at least one measurement tool is adapted to measure at least one environmental parameter selected from the group consisting of light level, and pH level.

14. The device of claim 12, wherein said measurement tool is in a location selected from the group consisting of internally to the device, on the surface of the device and externally to the device.

15. The device of claim 1, wherein the device is a swallowable capsule.

16. An in vivo imaging device comprising:

at least one light source;

at least one light measuring element;

at least one imager; and

at least one controller, wherein the controller is configured to, during an imaging period, operate the light source, record the amount of light reflected to the light measuring element, and control the image gain level of the imager.

17. An in vivo imaging device comprising:

at least one lighting means for providing lighting for the device;

at least one imager means, for recording images for the device; and

at least one controller means for controlling the image gain level of the imager.

18. A method for operating an in vivo imaging device including at least one light source, the method comprising:

during an imaging period, operating at least one light source;

at a sampling instance, recording the amount of light reflected to at least one light measuring element; and

comparing an amount of light recorded at at least one sampling

instance within said imaging period to a determined light saturation threshold; and

controlling the imaging device's gain factor in relation to the difference between said amount of light recorded and said light saturation threshold.

19. The method of claim 18, comprising controlling the operation of the light source in relation to the difference between said amount of light recorded and said light saturation threshold.

20. The method of claim 18, comprising controlling operations of each of at least one of the light sources from a plurality of light sources.

21. The method of claim 18, comprising at least one function selected from the group consisting of controlling the intensity of said light source and controlling duration of light source operation in relation to the difference between said amount of light recorded and said light saturation threshold.

22. The method of claim 18, wherein when an amount of light recorded is above a determined light saturation threshold, ceasing said operation of said light source.

23. The method of claim 18, wherein when said amount of light recorded is above said determined light saturation threshold, decreasing said gain factor.

24. The method of claim 18, wherein when said amount of light recorded is below said determined light saturation threshold, increasing said gain factor.

25. The method of claim 18, wherein if said light received is substantially similar to said light saturation threshold, continuing exposure at a constant gain factor until full saturation is attained.

26. The method of claim 18, comprising, at at least a second sampling instance:

comparing an amount of light recorded to a determined light saturation threshold; and

controlling the imaging device's gain factor in relation to the difference between said amount of light recorded and said light saturation threshold at said second selected interval.

27. The method of claim 26, comprising controlling the operation of said light source in relation to the difference between said amount of light recorded and said light saturation threshold.

28. The method of claim 26, comprising controlling the operation of intensity of said light source in relation to the difference between said amount of light recorded and said light saturation threshold.

29. The method of claim 18, wherein said light measuring element includes at least a portion of a set of pixels disposed in an imager disposed within the in-vivo device.

30. The method of claim 18, wherein said light measuring element includes a photo detector, and wherein said device includes an imager.

31. The method of claim 18, wherein said recording the amount of light reflected is recorded from a portion of pixels of a frame.

32. The method of claim 26, wherein said light saturation threshold is defined when a selected number of pixels from said portion of pixels are saturated.

33. The method of claim 32, wherein substantially half of said portion of pixels are red pixels.

34. The method of claim 32, comprising calculating a gain factor based on how many of said selected number of pixels are saturated at at least one sampling instance.

35. The method of claim 34, comprising altering said operation of the light source relative to said calculated gain factor.

36. The method of claim 35, wherein said altering of the light source includes at least one function selected from the group consisting of altering illumination duration and altering illumination intensity for at least each one of said light sources.

37. The method of claim 23, wherein said decreases in said gain factor decrease a signal to noise disturbance factor.

38. The method of claim 24, wherein said increases in gain factor increase a signal to noise disturbance factor.

39. The method of claim 18, comprising detecting non-functional pixels in said light measuring element, and marking said non-functional pixels as non-usable.

40. The method of claim 18, wherein the device is a swallowable capsule.

41. A method for operating an in vivo imaging device including at least one light source, the method comprising:

during an imaging period, operating at least one light source;

at a sampling instance, recording the amount of light reflected to at least one light measuring element; and

comparing an amount of light recorded at at least one sampling instance within said imaging period to a determined light saturation threshold; and

controlling at least one function selected from the group consisting of controlling the intensity of said light source, controlling duration of light source operation, and controlling the imaging device's gain factor in relation to the difference between said amount of light recorded and said light saturation threshold.

42. An in vivo imaging device comprising:

at least one light source;

at least one imager; and

at least one controller, wherein the controller is configured to detect problematic pixels in said imager, and define said problematic pixels as non-functional.

43. The device of claim 42, wherein said imager is configured to provide an exposure that is of a shorter duration than typically required for saturation of a functional pixel.

44. The device of claim 42, wherein said controller detects at least one pixel that reflects a saturation level above a threshold saturation level.

45. An in vivo imaging device comprising:

at least one light source;

at least one imager configured to provide an exposure that is of a shorter duration than typically required for saturation of a functional pixel; and

a controller, wherein the controller is configured to detect problematic pixels in said imager, based on said short exposure, and define said problematic pixels as non-functional.

46. An in vivo imaging device comprising:

at least one lighting element for providing lighting for the device;

at least one imager element, for recording images for the device; and

at least one controller element for detecting problematic pixels in the imager, and defining the problematic pixels as non-functional.

47. A method for detecting problematic pixels in an imaging device, the method comprising:

initiating an exposure that is of a shorter duration than required for typical saturation of at least one functional pixel;

detecting at least one pixel that reflects a saturation level above a threshold saturation level; and

defining said at least one pixel that reflects a saturation level above said threshold saturation level as non-functional.

48. The method of claim 47, comprising mapping said non-functional pixels.

49. The method of claim 48, comprising excluding said non-functional pixels from future saturation level determination processes.

50. The method of claim 47, wherein said imaging device is included within a swallowable capsule.

51. A method for detecting problematic pixels in an imaging device, the method comprising:

initiating an exposure that is of a shorter duration than required for saturation of a functional pixel;

detecting at least one pixel that reflects a saturation level above a threshold saturation level;

defining said at least one pixel that reflects a saturation level above said threshold saturation level as non-functional; and

excluding said non-functional pixels from future saturation level determination processes.

52. An in vivo imaging device comprising:

at least one light source;

at least one imager; and

at least one controller, wherein the controller is adapted to operate the light source to provide dark frames at determined frame intervals and record the amount of light reflected to the imager during said dark frame.

53. The imaging device of claim 52, wherein said dark frame includes a frame wherein a substantially inadequate amount of light is exposed by said light source.

54. The imaging device of claim 52, wherein said controller is capable of determining the location of the device according to said amount of light reflected to the imager during said dark frame.

55. The imaging device of claim 54, wherein said location of the device is determined to be at least one environment selected from the group consisting of outside the body, inside the body, in the mouth, in the throat, in the esophagus, and in the stomach.

56. The imaging device of claim 52, wherein the controller is configured to change the device operation mode in relation to said amount of light.

57. An in vivo imaging device comprising:

at least one light source;

at least one imager; and

at least one controller, wherein the controller is adapted to operate the light-source to provide dark frames at determined frame intervals, record the amount of light reflected to the imager during said dark frame, and change the imaging device operational mode in relation to said amount of light recorded.

58. An in vivo imaging device comprising:

at least one lighting means for providing lighting for the device;

at least one imager means , for recording images for the device; and

at least one controller means for operating the lighting means to provide dark frames at determined frame intervals and recording the amount of light reflected to the imager means during said dark frame, further determining the location of the device according to said amount of light reflected to the imager means during said dark frame.

59. A method for determining when an in vivo device enters into a body, the method comprising:

configuring a dark frame at a selected frame interval in a device imager unit;

at every said dark frame, providing a substantially inadequate exposure by at least one light source;

measuring an exposure of a reflected image for said dark frame as a function of a light saturation threshold; and

when said dark frame requires a substantially low amount of light to be saturated, defining the device as being outside a body.

60. The method of claim 59, wherein when said dark frame requires a substantially significant amount of light, defining the device as being inside a body.

61. The method of claim 60, comprising changing the operating mode of the device at a determined time interval after the device is defined as being inside a body.

62. The method of claim 59, wherein said determining a required amount of light to be saturated relates to a required imager gain level for said dark frame.

63. The method of claim 60, comprising changing an operation mode of the device, after the device is defined as being inside a body.

64. A method for determining when an in vivo device enters into a body, the method comprising:

configuring a dark frame at a selected frame interval in a device imager unit;

at every said dark frame, providing a substantially inadequate exposure by at least one light source;

measuring an exposure of a reflected image for said dark frame as a function of a light saturation threshold;

when said dark frame requires a substantially high amount of light to be saturated, defining the device as being inside a body; and

changing the operating mode of the device at a determined time interval after the device is defined as being inside a body.

65. An in vivo imaging device comprising:

at least one light source;

at least one imager;

at least one environment measuring tool; and

at least one controller, capable of operating the light source, imager, and monitoring tool, such that when the measuring tool measures at least one environmental parameter the controller is capable of defining the location of the device based on said at least one environmental parameter.

66. The imaging device of claim 65, wherein said location of the device is at least one environment selected from the group consisting of outside the body, inside the body, in the mouth, in the throat, in the esophagus, in the stomach, and in the GI tract.

67. The imaging device of claim 65, wherein the controller is configured to change the device operation mode in relation to said device location.

68. The imaging device of claim 65, wherein the environment monitoring tool operates in at least one location selected from the group consisting of on the device, in the device and outside the device.

69. An in vivo imaging device comprising:

at least one light source;

at least one imager;

at least one environment measuring tool; and

a controller, capable of defining the location of the device based on at least one environmental parameter measured by said measuring tool, and changing the operating mode of the device according to said defined location.

70. An in vivo imaging device comprising:

at least one lighting means for providing lighting for the device;

at least one imager means, for recording images for the device;

an environment measuring means for measuring at least one environmental parameter; and

at least one controller means for operating the lighting means imager means , and measuring means .

71. A method for determining a location of an in-vivo device, the method comprising:

measuring at least one environment parameter in an environment surrounding the device, using at least one measuring tool;

determining a change in said at least one environment parameter; and

based on said environmental change, determining that the device is in a new location.

72. The method of claim 71, wherein monitoring tool measures at least one characteristic of the environment, and compares at least one said characteristic with a previous measurement of said characteristic.

73. The method of claim 71, wherein said tool is at least one tool selected from the group consisting of pH monitor, temperature monitor, and light level monitor.

74. The method of claim 71, further comprising changing the device operating mode after a new location is defined.

75. A method for determining a location of an in-vivo device, the method comprising:

measuring at least one environment parameter in an environment surrounding the device, using at least one measuring tool;

determining a change in said at least one environment parameter;

based on said environmental change, determining that the device is in a new location; and

changing the operating mode of the device at a determined time interval after the device is defined as being in a new location.

76. A method for changing the operation mode of an in vivo device, the method comprising:

measuring at least one environment parameter in at least one environment surrounding the device;

when an environmental change is determined, changing the operating mode of the device.

77. The method of claim 76, wherein said environmental change is at least one change selected from the group consisting of temperature change, pH level change and light level change.

78. The method of claim 76, wherein said environment monitoring is enabled by at least one tool selected from the group consisting of pH monitor, temperature monitor, and light level monitor.

79. The method of claim 76, wherein a controller determines when a significant environmental change is determined.

80. A method for changing the operation mode of an in vivo device, the method comprising:

measuring at least one environment parameter in at least one environment surrounding the device, using at least one environment measuring tool; and

when an environmental change is determined, changing the operating mode of the device.